New Technologies for the U.S. Navy

Recent SBIR / STTR Experiences

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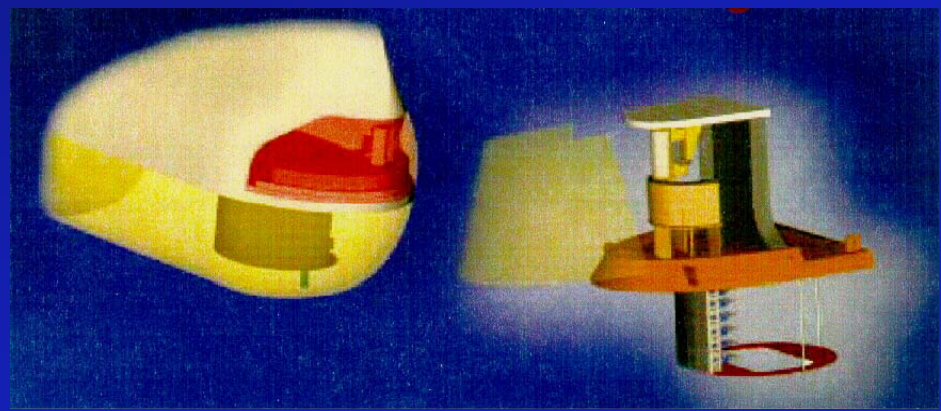
Presentation Outline

- Recent SBIR/STTR experiences with technologies for future Navy ships
  - The technologies
    - Targeting DD(X) and beyond
  - The partners
    - Raytheon IDS and Northrop Grumman Ship Systems
  - Fleet insertion / transition plans
- Working with the “Primes” and the “Sponsors”
  - Our view of what worked (and what didn’t)
- Closing remarks

Technology 1 - Sonar Windows for DD(X)

Sonar systems need a protective window that maximizes acoustic transmission across a wide range of frequencies

MSC has developed a material that has the potential to provide a 3-5X reduction in operational and maintenance costs



Baseline Sonar Window Technology

- Sonar dome wire reinforced rubber windows
  - History of rupturing in service spawned a Naval Research Laboratory sponsored program to develop a non-corroding composite sandwich dome concept or NSDCW
- NSDCW is the baseline on DD(X)
  - Sets the bar for acoustic performance, structural reliability and cost

MSC-LIL Material Technology Summary

Future sonar systems need a low cost structurally robust protective window that maximizes acoustic transmission across a wide range of frequencies

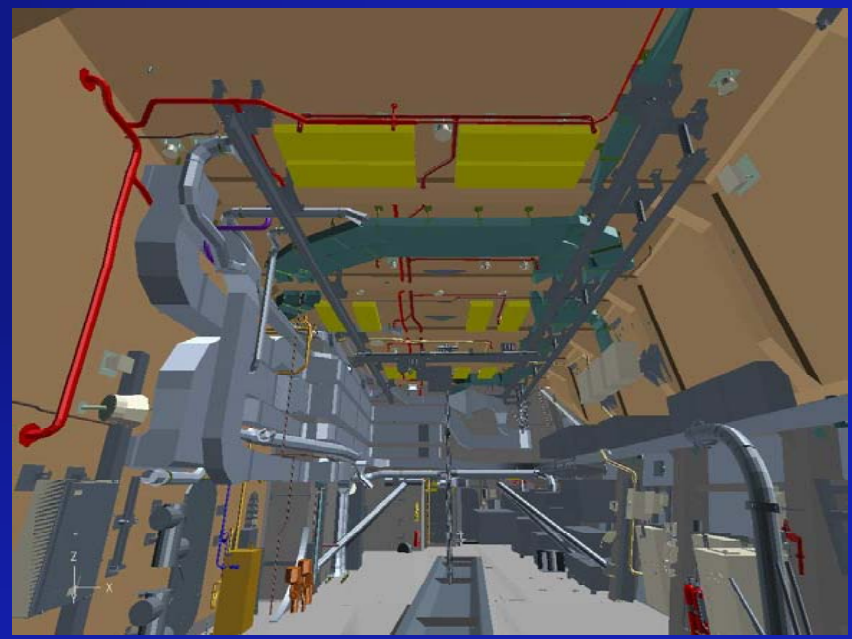
MSC-LIL Feature	Advantage	Benefit
Effectively homogeneous at a scale of 5mm and does not include a discrete core	Lower insertion loss at higher transmit frequencies and off-normal angles	Superior off-normal acoustic performance for systems operating at high frequency
Includes continuous fiber reinforcement	Traditional low-cost composite fabrication processes can be used	Initial manufacturing costs on the order of 50% of autoclave cured polymer materials
High elongation to failure	Acoustic window can be extremely damage tolerant	Better performance under routine impact loads

Current Transition Plan for the *MSC-LIL*

Milestone	Navy Command	Prime Contractor	Target Date
Engineering Development Module Testing – DD(X)	NUWCNPT	Raytheon	Jan 2005
Structural Qualification of the *MSC-LIL*	PMS-500 SEA-05	Raytheon	May 2006
Back-fit on DDG to gather at-sea data	IWS5	TBD	TBD

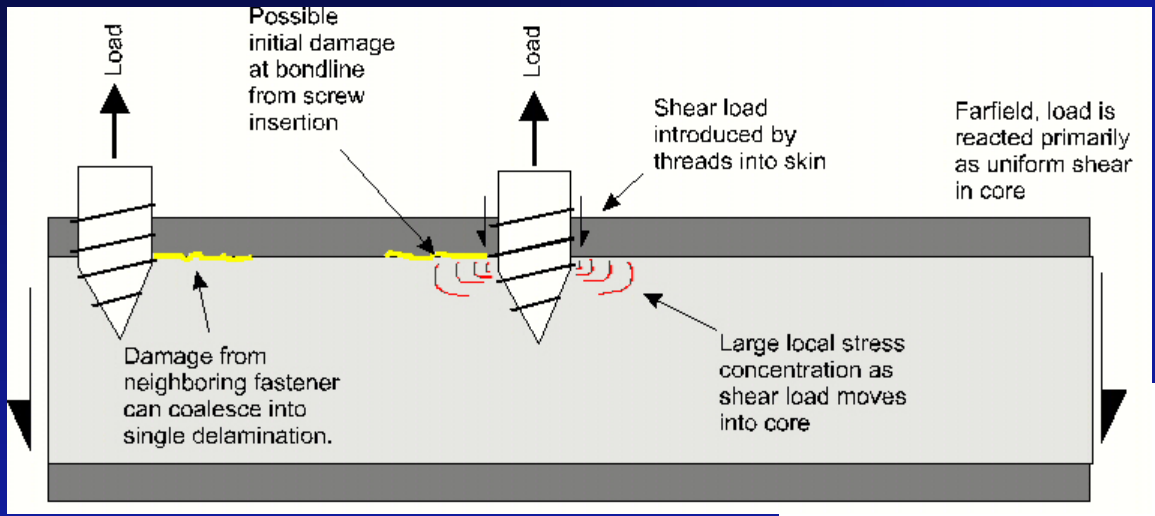
Technology 2 – Attachment Devices for DD(X)

- The next generation of Navy ships needs methods for mounting equipment to composite sandwich structures
- MSC has developed a low cost, easy-to-install structurally robust device for attaching medium to heavy weight items to composite ship structures

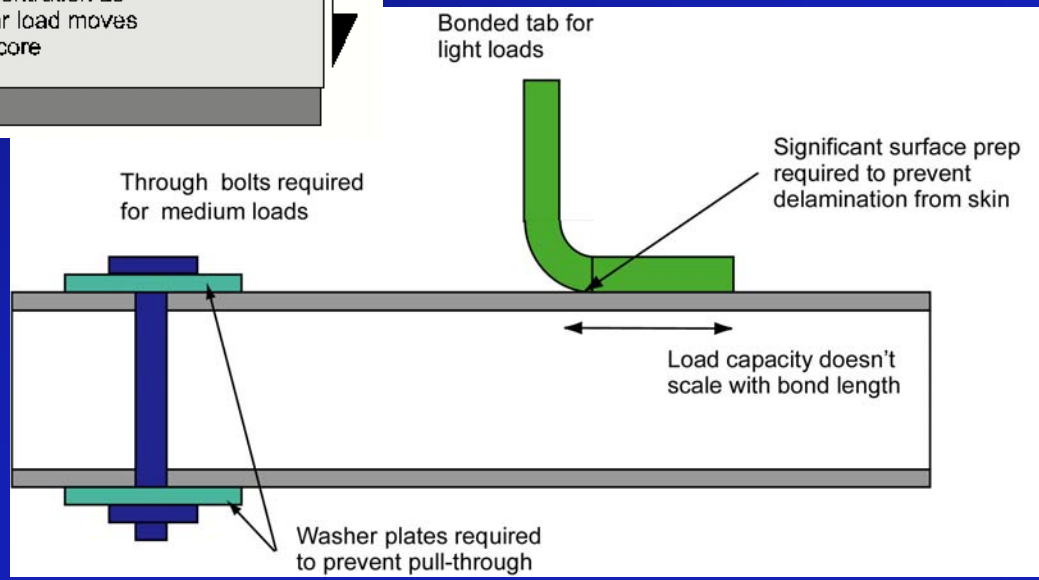


A schematic showing the myriad of items that must be mounted to a ships structure

Current Attachment Alternatives



"Self-Tapping" Screws Preferred



Alternatives Include Bonded Tabs and Through Bolts

Current Methods – Through Bolts and Screws

Pull-through failure of countersunk fastener

Self-tapping screws cause significant structural damage

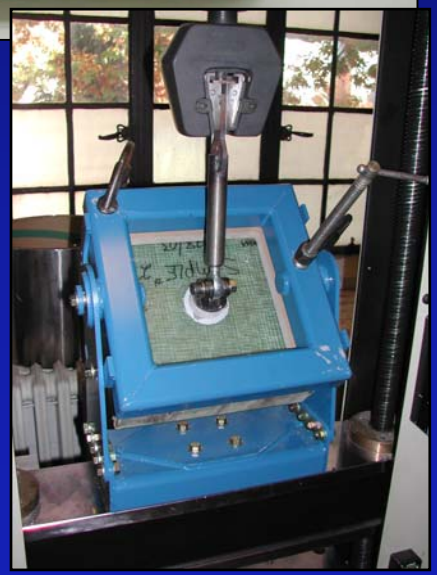
MSC-CAN Technology Summary

MSC has developed a low cost, easy-to-install structurally robust device for attaching medium to heavy weight items to composite sandwich structures

MSC-CAN Feature	Advantage	Benefit
Installed at any location on a sandwich structure	Equipment locations not needed while designing the structure	Reduction in (re)design and structural modifications
Installed from one side and does not pierce both skins of the sandwich	Installed by a single technician and does not alter the exterior surface	Cost reduction and improved stealth or hydro performance
Supports higher loads than existing methods	Allows mounting of heavier equipment per attachment	Lower cost due to fewer attachment locations
Non-corrosive	Will not accelerate corrosion of mounted equipment	Reduced operation and maintenance costs

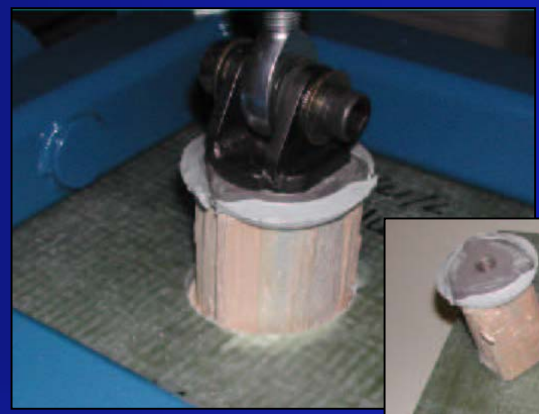
Experimental Approach

Pre Assembly



A *MSC-CAN* Under Test

At Failure



Post Test - Note Minimal Skin Damage

Average Test Values	
4-Screw Pad	6380 lbs
1/2 Thru-bolt	5990 lbs
CRES *MSC-CAN*	8080 lbs

Current Transition Plan for the *MSC-CAN*

Milestone	Navy Command	Prime Contractor	Target Date
Engineering Development Module Testing – DD(X)	NSWCCD	NGSS	July 2004
Delivery of Installation Procedures for *MSC-CAN*	PMS-500 SEA-05	NGSS	Sept 2004
Structural Qualification of the *MSC-CAN*	PMS-500 SEA-05	NGSS	Sept 2005

Why Transition is Working (1 of 2)

- The SBIR research was conducted in-parallel with baseline engineering development
  - » DD(X) program pace and focus on risk management have allowed SBIR technology insertion
  - » Similar MSC transition efforts with less opportune timing have been unsuccessful
- The TPOC's knew of a true fleet need and believed that alternate technologies could work
  - » Continued involvement into Phase II and Phase III transition planning

Why Transition is Working (2 of 2)

- The Primes and government Labs have made, and continue to make, technical (and financial) contributions to the work
  - *MSC-LIL* material
    - Raytheon IDS involvement fostered by Opportunity Forum
    - NUWCNPT and Raytheon working jointly to evaluate test data
      - → MSC / NUWCNPT CRADA under development
  - *MSC-CAN* attachment devices
    - NGSS a partner since Phase I proposal
      - → NGSS has contributed IRAD dollars
    - Leveraging CDNSWC test data from program sponsor

Closing Remarks

- For transitions to work
  - SBIR research cycle timing must be right for insertion
    - Reaching appropriate TRL level under SBIR (only) funding is challenging
  - TPOC must have a good understand of the problem
    - ……. and be willing and able to “sell” the technology along with the small business
  - The Prime must really embrace collaboration
    - Throughout engineering, management and procurement